

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

USDI: Bangor, Me.

**AVAILABILITY OF GROUND WATER IN THE
ANDROSCOGGIN RIVER BASIN,
NORTHERN NEW HAMPSHIRE**

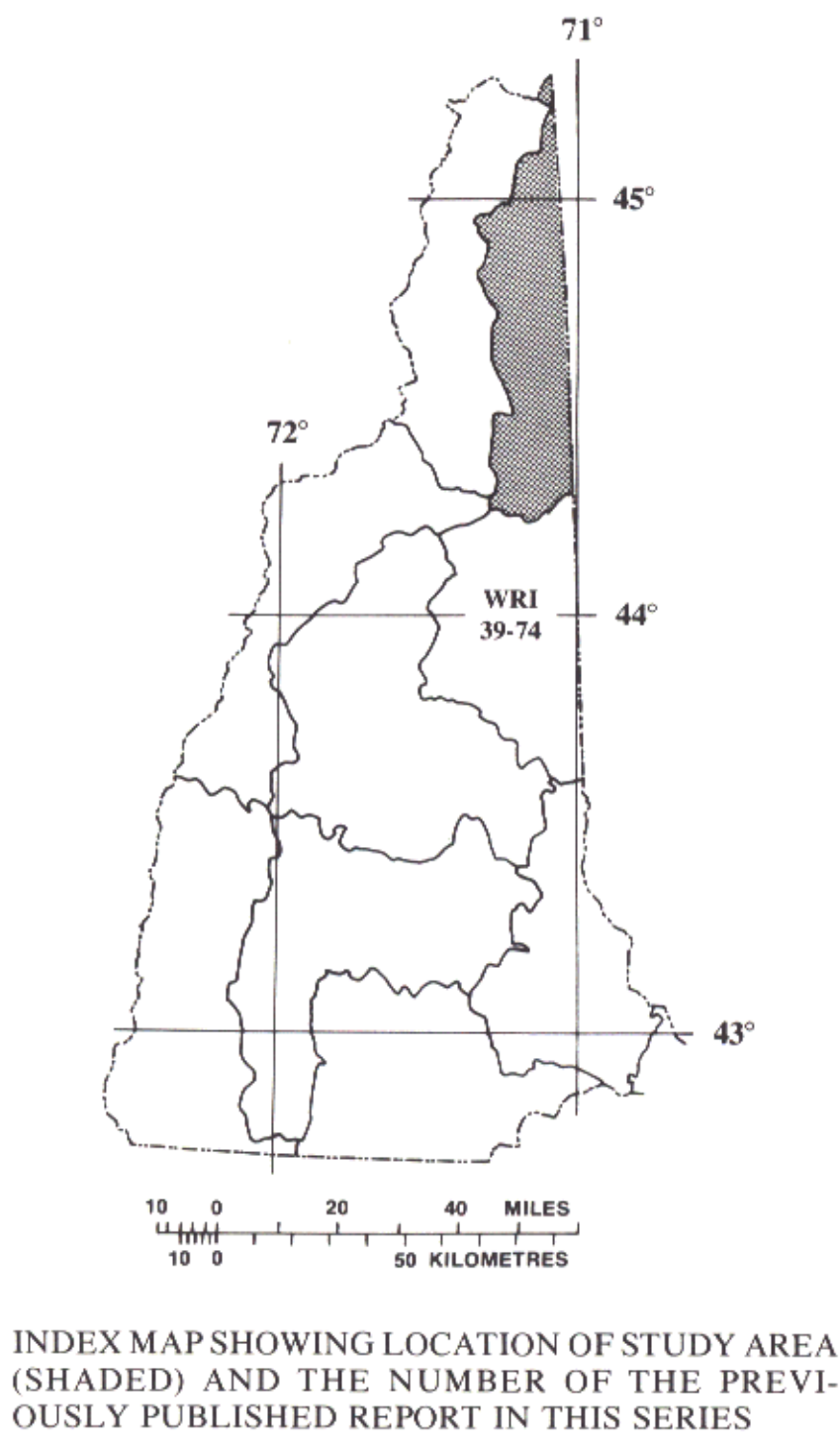
By
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WATER-RESOURCES INVESTIGATIONS 22-75

PREPARED IN COOPERATION WITH THE
NEW HAMPSHIRE WATER RESOURCES BOARD

Concord, New Hampshire

1975



INDEX MAP SHOWING LOCATION OF STUDY AREA (SHADED) AND THE NUMBER OF THE PREVIOUSLY PUBLISHED REPORT IN THIS SERIES

OCCURRENCE OF GROUND WATER

This report provides a guide for ground-water exploration and for water- and land-use planning and management. Sufficient amounts of water to supply single family homes is available from the bedrock aquifer nearly everywhere in the Androscoggin River basin. Relatively thin and narrow, unconsolidated aquifers of sand or sand and gravel capable of sustaining the moderate and high yields generally require by industries and municipalities are found only in major stream valleys.

The map provides a preliminary assessment of the availability of ground water in the basin, as determined by estimating the capability of the aquifers to store and transmit water. On the map, aquifers are rated as having high, medium, or low potential to yield water.

Bedrock or ledge (crystalline rock) in most of this river basin is covered by a veneer of unconsolidated glacial deposits of till and layered (stratified) gravel, sand, silt, and clay. The bedrock is hard and compact; it contains recoverable water only in open fractures. The size, number, distribution, and interconnection of fractures are highly variable, but are commonly minimal. Therefore, although wells penetrating bedrock commonly yield dependable supplies of good quality water for single family domestic needs, individual wells generally do not yield enough water to sustain supplies for municipal or industrial use. However, part of Errol is supplied by two low-yielding bedrock wells. Zones where bedrock is extensively fractured might yield larger supplies of water.

Glacial till, locally called hardpan, is an unsorted mixture of clay, silt, sand, gravel, and boulders. Till is widespread and overlies bedrock. The average thickness of till is probably less than 30 feet (9 metres), but in places the thickness exceeds 60 feet (18 metres). A significant amount of water is stored in thick till, but it is transmitted very slowly through the small intergranular open spaces (pores) of the deposits. Accordingly, till is a poor aquifer and normally does not yield enough water to meet municipal, industrial, or commercial needs. In some places till will yield enough water to large-diameter dug wells to supply single family domestic needs, but this yield may not be dependable during droughts, when the water table declines and there is less water in storage.

Stratified deposits of gravel, sand, silt, and clay occur chiefly in the valley bottoms. These materials have abundant pore space between grains to store water; pore space may amount to 30 percent or more of the total volume of the deposit. In places the water-saturated thickness of these deposits is more than 60 feet (18 metres). The average grain size and the average pore size between grains varies greatly, and thus the ability of these deposits to transmit water varies greatly. The pores between grains of clay, silt, and fine sand are so small that water flows through them very slowly. The relatively large pore spaces between grains of medium to very coarse sand and gravel allow relatively rapid transmission of water.

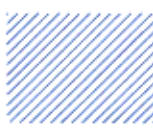
Because sand and gravel can both store and transmit large quantities of water they form the most productive aquifers in New Hampshire. For this reason ground-water exploration and development has been most successful in thick, water-saturated sand and gravel deposits.

EXPLANATION

Patterns used below to designate areas apply only to the Androscoggin River basin and not to the adjoining areas.



Areas inferred to be underlain by medium to very coarse sand or sand and gravel with sufficient saturated thickness to have high potential to yield water. Included are areas with fine-grained surficial deposits, which are inferred to be underlain by medium to very coarse sand or sand gravel. Wells located by systematic ground-water exploration within these areas should yield sufficient quantities of water to meet or augment municipal and industrial requirements. Deposits are thinner and wells would be less productive along the margins of these areas. Pumping wells adjacent to streams or lakes may induce surface water to infiltrate the aquifer.

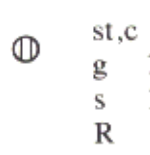


Areas inferred to be underlain by very fine and fine sand, silt, and clay have low potential to yield water. These deposits may yield sufficient water to wells for domestic and light commercial use. In places, thin lenses of coarse sand or sand and gravel with higher potential yield may occur within or underlie these deposits, but these lenses may or may not have adequate storage or recharge to provide large sustained well yields.



Well
— Depth of well, in feet
70-80 — Depth to bedrock, in feet
350 — Yield of well, in gallons per minute

To convert feet to metres, multiply by 0.3048
To convert gallons per minute to litres per second, multiply by 0.06309



Boring
Generalized description, stratigraphic position, and approximate thickness, in feet, of material penetrated. Data based on borings of the New Hampshire Department of Public Works and Highways except for U.S. Geological Survey boring near State Route 26 about 1.8 miles northwest of center of Errol.

g - gravel st - silt t - till
s - sand c - clay R - refusal

To convert feet to metres, multiply by 0.3048

GROUND-WATER QUALITY

Ground water in the Androscoggin River basin is generally of good chemical quality. Most of it is clear and colorless, contains no suspended matter and practically no bacteria, and is low in dissolved-solids concentration. Also, it is generally soft (0-60mg/l - milligrams per litre of hardness), requiring little soap to produce suds, or moderately hard (61-120 mg/l).

Several water-quality problems may occur within the basin. Iron and manganese may occur in concentrations greater than the limits for drinking water, 0.3 and 0.05 mg/l respectively, recommended by the U.S. Public Health Service (1962). In places, excessive amounts of iron and manganese may restrict usefulness of the water. Water in unconsolidated deposits is generally weakly acidic, and locally it may have enough acidity to be slightly corrosive to metal plumbing.

Locally, the chemical quality of ground water may reflect land-use practices. Degradation of water quality may occur in unsewered residential and village areas, near solid-waste-disposal sites, agricultural land, and major highways.

If surface water induced to flow into an aquifer in response to pumping reaches the well, the quality of the pumped water will reflect the chemistry of both the surface water and the native ground water. At present (1975), surface water quality may not always meet the proposed standards (Classes A, B, and C) for this basin; where the standards are met for those areas classified "A" and "B," ground-water quality is expected to be unimpaired. The Androscoggin River below Berlin is classified "C," and quality of water pumped from adjacent aquifers may be impaired. Locally, surface waters contain relatively high concentrations of organic material (commonly termed "brown water"). Chemical changes may occur when this water is induced to infiltrate an aquifer. For example iron, manganese, and color might increase to levels in excess of those recommended by the U.S. Public Health Service (1962) for public drinking supplies.

*New Hampshire Water Supply and Pollution Control Commission and U.S. Environmental Protection Agency (1971). Class A - Potentially acceptable for public water supply after disinfection. No discharge of sewage or other wastes. (Quality uniformly excellent). Class B - Acceptable for bathing and recreation, fish habitat and public water supply after adequate treatment. No disposal of sewage or wastes unless adequately treated. (High aesthetic value). Class C - Acceptable for recreational boating, fishing, and industrial water supply with or without treatment, depending on individual requirements. (Third highest quality).

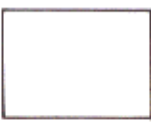
GROUND-WATER EXPLORATION

This preliminary resource appraisal is a guide for ground-water exploration, development, and planning in the Androscoggin River basin. Additional evaluations of potential aquifer yield, whether regional or local in scope, might include geophysical exploration, test drilling, and aquifer pumping tests to determine aquifer hydraulic properties and boundaries and to determine relationships between surface water and ground water.

SELECTED REFERENCES

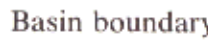
New Hampshire Water Supply and Pollution Control Commission and U.S. Environmental Protection Agency, 1971. Water-quality standards summary (New Hampshire): New Hampshire Water Supply and Pollution Control Comm., 91 p.
U.S. Public Health Service, 1962 (revision). Public Health Service drinking water standards: U.S. Dept. Health, Education, and Welfare, Public Health Service, pub. no. 956, 61 p.

Areas inferred to be underlain by medium to very coarse sand or sand and gravel with relatively small saturated thickness and which have medium potential to yield water. Shallow wells and infiltration galleries located by systematic ground-water exploration within these areas may yield sufficient quantities of water for small municipal and rural water districts, and commercial and light industrial use. Deposits are thinner, and wells would be less productive along the margins of these areas, except where they border areas of high potential. Pumping wells adjacent to streams or lakes may induce surface water to infiltrate the aquifer.

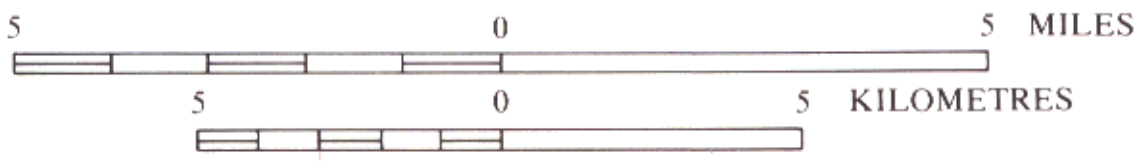


Areas in which glacial till (hardpan) and bedrock (ledge) are at, or inferred to be near, the surface have low potential to yield water. Included are areas with thin deposits of gravel, sand, silt, or clay underlain by till or bedrock, and areas of relatively thick deposits of sand or sand and gravel (high terraces) with little or no saturated thickness during dry periods. Wells in till and bedrock commonly yield sufficient water for single family domestic use. In places, where wells penetrate extensive, saturated zones of fractures in bedrock, wells yield moderate amounts of water.

Reach of Androscoggin River designated by New Hampshire Water Supply and Pollution Control Commission to meet water-quality standards of Class C. All other surface water in the basin designated to meet standards of Classes A or B.

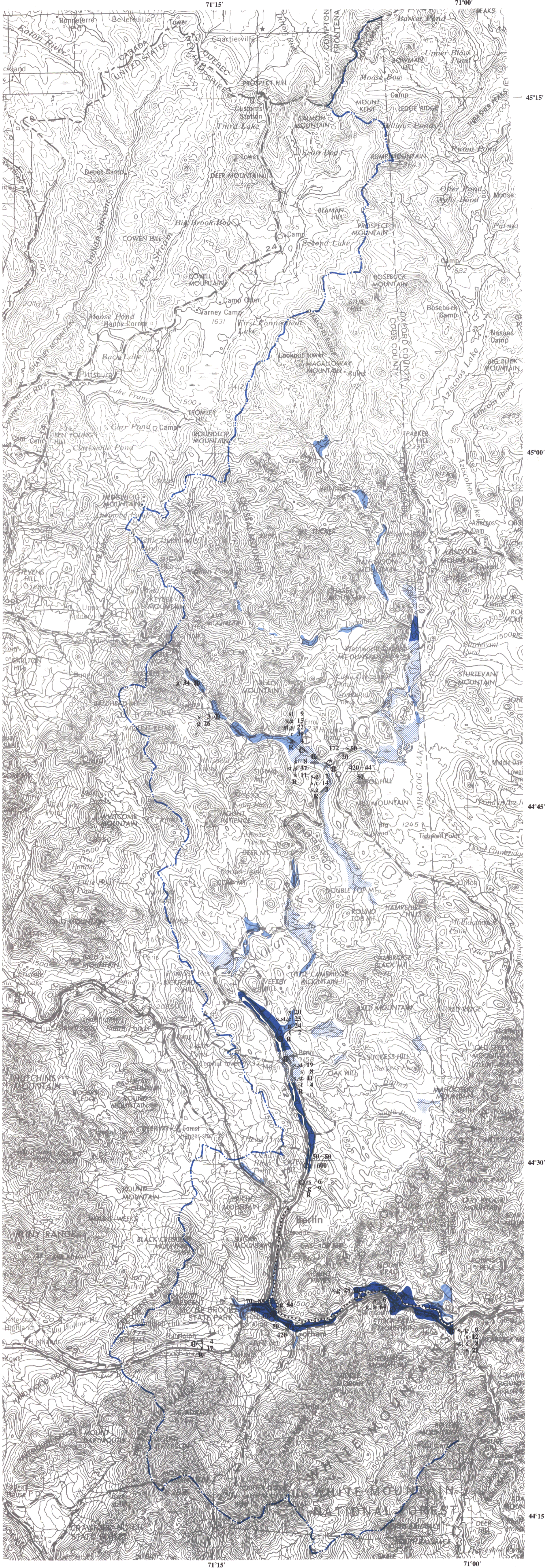


SCALE 1:125 000



CONTOUR INTERVAL 100 FEET (30 METRES)
DATUM IS MEAN SEA LEVEL

Base from U.S. Geological Survey, 1:250,000 quadrangles; Lewiston, 1956; Sherbrooke, 1961



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OPEN-FILE REPORT
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